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Botulinum Toxin: a Poison Transformed into a Versatile Tool

Botulinum toxin (BTX), also called a “miracle poison,” is a neurotoxin produced by the bacterium *Clostridium botulinum*. Justinus Kerner,¹ a German physician and poet, first identified botulinum toxin between the years of 1817 and 1822. He described it as a “sausage poison” (sausage in Latin is *botulus*) and “fatty poison,” as this bacterium often caused poisoning by growing in improperly handled or prepared meat products. The toxin was first isolated in 1946 and a medical application for the substance was discovered in the 1950s. There are seven main serotypes of the neurotoxin that have been identified: A, B, C (1 and 2), D, E, F, and G. All seven serotypes are structurally similar but immunologically distinct in their potency, duration of action, and cellular target sites. They possess similar molecular weights and subunit structure, but have different amino acid sequences.² Humans can be affected by the toxins of five strains (A, B, E, F, and G) and are not affected by the toxins of strains C and D.³

When injected, the various preparations of BTX produce local, temporary,

and reversible cholinergic chemodeneration of muscles and glands. The property of the toxin that interferes with neural transmission and blocks the release of acetylcholine, causing muscle paralysis, plays an important role in the management of many cosmetic, medical, and dental conditions. Depending on the target tissue, BTX can block cholinergic neuromuscular innervation of intra- and extrafusal muscle fibers or cholinergic autonomic innervation of sweat, lacrimal and salivary glands, and smooth muscles. Thus, it acts as a versatile clinical tool for a growing list of conditions resulting from muscular hyperfunction.

It gains its appeal as a cosmetic drug because it does not require general anesthesia or surgery. BTX is widely used in cosmetic applications for the treatment of facial wrinkles after local injection, but conditions such as cerebral palsy, muscular spasms, urinary incontinence, headaches, tinnitus, excessive sweating, cricopharyngeal achalasia, post-stroke spasticity, hemifacial spasms, temporomandibular joint disorders, bruxism,



sialorrhea, neuropathic facial pain, muscle movement disorders (dystonias), masticatory myalgias, and facial nerve palsy could be treated with this drug. In orthodontics, it can be used to treat downturned and gummy smiles, lip augmentation, and also for cases where retraining of the facial muscles is required. Many other indications are under investigation, and further applications for BTX are likely to be developed.⁴⁻⁷

Botulinum toxin in the dental office offers a reversible alternative to more aggressive procedures such as full-mouth reconstruction, orthodontics, and orthognathic surgery. Recently, BTX is reported to be clinically used in dental implantology for the prophylactic reduction of masseter and temporalis muscle strength after implantation in immediate load protocols.⁸

In December 1989, BTX-A was approved by the U.S. Food and Drug Administration (FDA) under the trade name Botox (Allergan, Irvine, CA, USA) for the treatment of strabismus, blepharospasm, and hemifacial spasm in patients younger than 12 years old. In 2000, Botox was approved for treating cervical dystonia (wry neck) and two years later, on April 15, 2002, the FDA announced the approval of botulinum toxin type A to treat moderate-to-severe frown lines between the eyebrows (glabellar lines). Since then, Botox has been evaluated off-label for the treatment of spasticity and muscle pain disorders. Botulinum toxin type B (BTX-B) received FDA approval for treatment of cervical dystonia on December 21, 2000. Trade names for BTX-B are Myobloc in the United States and Neurobloc in the European Union. Serotype F is also under inves-

tigation in patients who are resistant to serotypes A and B.

At present, there are six different BTX preparations available commercially, out of which five contain BTX-A (Botox, Dysport, Xeomin, Prosigne, and PurTox) and the sixth contains BTX-B (Myobloc/Neurobloc). Botulinum toxin A is usually preferred because of its long duration of action and ease of production. Approval procedures are complex and vary between preparations and countries, but in general Botox has garnered the most approvals worldwide, followed by Dysport.⁷

BTX has received extensive press and media coverage along with several articles being written about its cosmetic advantages, but now the therapeutic uses of the drug are gaining attention. The time for BTX to enter the field of dentistry has arrived. As we, the qualified dental surgeons, are best trained to recognize and treat diseases of the masticatory system, along with proper knowledge of the facial anatomy and after receiving adequate training in the subject of BTX treatment, we can practice it at our dental office with appropriate sterilization and storage facilities in place. Active research is underway on the possible uses of this toxin in several fields of medicine and dentistry. Though more extensive confirmation of its use in multiple dental applications is needed, it is evident that the potential use of botulinum toxin in the dental profession can be of great value. Judicious use of botulinum toxin will ensure that it continues to be an important therapeutic option and improves the quality of life of patients.



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